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FINANCIAL PROVISION FOR THE DEVELOPMENT OF THE  
PROPOSED UNDERGROUND KHWARA MANGANESE MINE

SLR PROJECT NO.: 720.12015.00004  
DMR REFERENCE NO.: NC30/5/1/2/2/10122MR

REPORT NO.: 1

Khwara Manganese (Pty) Ltd

September 2017

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## DOCUMENT INFORMATION

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## FINANCIAL PROVISION FOR THE DEVELOPMENT OF THE PROPOSED UNDERGROUND KHWARA MANGANESE MINE

### EXECUTIVE SUMMARY

#### Introduction

Khwara Manganese (Pty) Ltd (Khwara) held a prospecting right for manganese on Portion 2 of the farm Wessels 227 and the Remaining Extent and Portions 3 and 4 of the farm Dibiaghomo 226, north of Black Rock in the Northern Cape Province. On the adjacent farm (Portion 1 of Lehating 741), Lehating Mining (Pty) Ltd (Lehating) holds the mining right and have an approved environmental management programme (EMP) from the Department of Mineral Resources (DMR) for manganese and iron (approved October 2013). Lehating also hold an environmental authorisation (EA), issued by the Department of Environment and Nature Conservation (DENC) in September 2014 in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA). It is important to note that the construction of the Lehating Mine commenced on 6<sup>th</sup> September 2017.

Khwara has applied to the DMR for a mining right over the above portions of the farms Wessels 227 and Dibiaghomo 226, referred to as the Khwara Mine project. The resource will be accessed and mined from the Lehating mine (underground). Approved surface infrastructure at the Lehating Mine will be used to support the mining of the underground resource on the farms Wessels 227 and Dibiaghomo 226 and as such no surface infrastructure will be established as part of the proposed project.

SLR Consulting (South Africa) (Pty) Ltd (SLR), an independent firm of environmental consultants, has been appointed by Khwara to prepare the preliminary closure plan financial provision for proposed project.

#### Preliminary closure plan objectives

The preliminary closure plan objectives and principles include the following:

- Environmental damage is minimised to the extent that it is acceptable to all parties involved
- Allow for the continued use of the current land use (grazing)
- Prevent the loss of third party groundwater supply
- Mine closure is achieved efficiently, cost effectively and in compliance with the law
- The social and economic impacts resulting from mine closure are managed in such a way that negative socio-economic impacts are minimised.

#### Legal framework

This financial provision has been prepared in accordance with GNR 1147 of the National Environmental Management Act (107/1998): *Regulations pertaining to the financial provision for prospecting,*

exploration, mining or production operations, published 20 November 2015 (Financial Provisioning Regulations, 2015). The table below details the requirements of GNR 1147 and also the relevant sections in the report where these requirements are addressed.

<b>GNR 1147 – Appendix 3, 4 and 5</b>		<b>Relevant section in the report</b>
<b>Annual Rehabilitation Report (Appendix 3)</b>		
3(a)-(g)	Content of report	Section 0
<b>Closure Plan (Appendix 4)</b>		
3(a)	Details of the specialists	Section 2
3(b)(i)	Material information	Section 3.1
3(b)(ii)	Environmental and social context	Section 3.2
3(b)(iii)	Stakeholder issues and comments	Section 3.3
3(b)(iv)	Mining plan and schedule	Section 4
3(c)(i)	Risk assessment methodology	Section 5.1
3(c)(ii)	Identification of indicators	Section 5.3
3(c)(iii)	Strategies to manage/mitigate risks	Section 5.2
3(c)(iv)	Reassessment of risks	Section 5.4
3(c)(v)	Changes to risk assessment results	n/a – no changes deemed necessary
3(d)(i)	Legal and governance framework	Section 6.1
3(d)(ii)	Closure vision and objectives	Section 6.2
3(d)(iii)	Evaluation of alternatives	n/a - no alternative closure and post closure options are deemed applicable
3(d)(iv)	Motivation for closure option	
3(d)(v)	Motivation for closure period	Section 6.5
3(d)(vi)	Details of ongoing research	n/a – no ongoing research deemed necessary
3(d)(vii)	Assumptions made for closure	Section 6.7
3(e)(i)	Post-mining land use	Section 7
3(e)(ii)	Map of post mining land use	n/a – land to be returned to pre-disturbance state
3(f)(i)	Specific technical solutions	Section 8
3(f)(ii)	Threats and uncertainties	Section 8
3(g)(i)&(iii)	Schedule of actions	Section 9
3(g)(ii)	Assumptions and drivers	Sections 6.7
3(h)(i)-(iii)	Organisational capacity and structure	Section 10
3(i)	Indication of gaps	Section 11
3(j)	Relinquishment criteria	Section 12
3(k)(i)	Closure cost estimate & accuracy	Section 13
3(k)(ii)	Closure cost estimate methodology	Section 13.2
3(k)(iii)	Annual updates	Section 13.3
3(l)(i)-(iii)	Monitoring, auditing and reporting	Section 15
3(m)	Amendments to the closure plan	n/a – no amendments deemed necessary
<b>Environmental Risk Assessment (Appendix 5)</b>		
(a)	Details of the specialists	Section 2
(b)(i)	Risk assessment methodology	Section 5.1
(b)(ii)	Latent risk substantiation	Section 5.2
(b)(iii)	Risk drivers	Section 5.2
(b)(iv)	Expected timeframe	n/a – no latent risks identified

GNR 1147 – Appendix 3, 4 and 5		Relevant section in the report
(b)(v)	Risk triggers	n/a – no latent risks identified
(b)(vi)	Risk assessment results	Section 5.2
(b)(vii)	Changes to risk assessment results	Section 5.4
(c)(i)	Monitoring to inform management	Section 15
(c)(ii)-(iv)	Alternative mitigation measures following impacts	n/a – no changes to risk identified
(d)(i)-(iii)	Cost estimation and accuracy	Section 13
(e)	Monitoring, auditing and reporting	Section 15

## Financial provision

The financial provision calculation for the proposed project at LOM is provided in Table 1 below.

**TABLE 1: FINANCIAL PROVISION CALCULATION**

Description	Unit:	Quantity	Master rate	Amount (R)
Care and maintenance for 8 years	ha	2 987	R 0.00	R 0.00
Biodiversity inspections for 8 years	Sum	1.00	R 1 410 000.00	R 1 410 000.00
Specialist study (Screening level risk assessment)	Sum	1.00	R 200 000.00	R 200 000.00
		<b>Subtotal 1</b>		R 1 610 000.00
Preliminary and General (P&G)		12.0% of Subtotal 1		R 193 200.00
-	-	<b>Subtotal 2</b>		R 1 803 200.00
-	-	(Subtotal 2 plus P&G value)		
Contingency		10.0% of Subtotal 2		R 180 320.00
-	-	<b>Subtotal 3</b>		R 1 983 520.00
-	-	(Subtotal 3 plus Contingency value)		
VAT		14.0% of Subtotal 3		R 277 692.80
<b>GRAND TOTAL FOR MINING OPERATIONS (Subtotal 3 plus VAT)</b>				<b>R 2 261 212.80</b>

## FINANCIAL PROVISION FOR THE DEVELOPMENT OF THE PROPOSED UNDERGROUND KHWARA MANGANESE MINE

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## FINANCIAL PROVISION FOR THE DEVELOPMENT OF THE PROPOSED UNDERGROUND KHWARA MANGANESE MINE

### 1 INTRODUCTION

Khwara held a prospecting right for manganese on Portion 2 of the farm Wessels 227 and the Remaining Extent and Portions 3 and 4 of the farm Dibiaghomo 226, north of Black Rock in the Northern Cape Province. Khwara has applied to the DMR for a mining right over the above portions of the farms Wessels 227 and Dibiaghomo 226, referred to as the Khwara Mine project.

SLR, an independent firm of environmental consultants, has been appointed by Khwara to prepare the financial provision for proposed project.

### 2 SPECIALIST INPUT

#### 2.1 SPECIALISTS THAT PREPARED THE FINANCIAL PROVISION

The details of the persons who prepared this financial provision report are provided in Table 2 below.

**TABLE 2: DETAILS OF THE PERSONS WHO PREPARED THIS REPORT**

Details	Environmental Assessment Practitioner and author	Professional Engineer and author	Reviewer
Company:	SLR	SLR	SLR
Name:	Natasha Smyth	Steve van Niekerk	Alex Pheiffer
Tel No.:	011 467 0945	011 467 0945	011 467 0945
Fax No.:	011 467 0978	011 467 0978	011 467 0978
E-mail:	<a href="mailto:nsmyth@slrconsulting.com">nsmyth@slrconsulting.com</a>	<a href="mailto:svanniekerk@slrconsulting.com">svanniekerk@slrconsulting.com</a>	<a href="mailto:apheiffer@slrconsulting.com">apheiffer@slrconsulting.com</a>

#### 2.2 EXPERTISE OF THE SPECIALISTS

Alex Pheiffer holds an MSc in Environmental Management is registered as a Professional Natural Scientist (Environmental Science) (#400183/05) with the South African Council for Natural Scientific Professions and has approximately 14 years of relevant experience.

Natasha Smyth holds a Hons in Geography and Environmental Management and has over 8 years of relevant experience.

Stephen van Niekerk is a manager at SLR, holds a MSc Engineering degree, has over 20 years of relevant experience and is registered as a Professional Engineer (#20010256) with the Engineering Council of South Africa (ECSA).

Copies of the specialist's curriculum vitae are attached in Appendix A.

### 2.3 DECLARATION OF INDEPENDENCE

I, Natasha Smyth and Steve van Niekerk hereby declare that we are independent consultants, who have no interest or personal gains in this proposed project whatsoever, except receiving fair payment for rendering an independent professional service.

## 3 CONTEXT OF THE PROJECT

### 3.1 MATERIAL INFORMATION

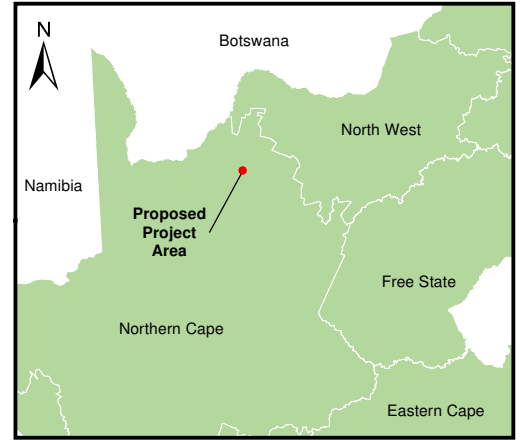
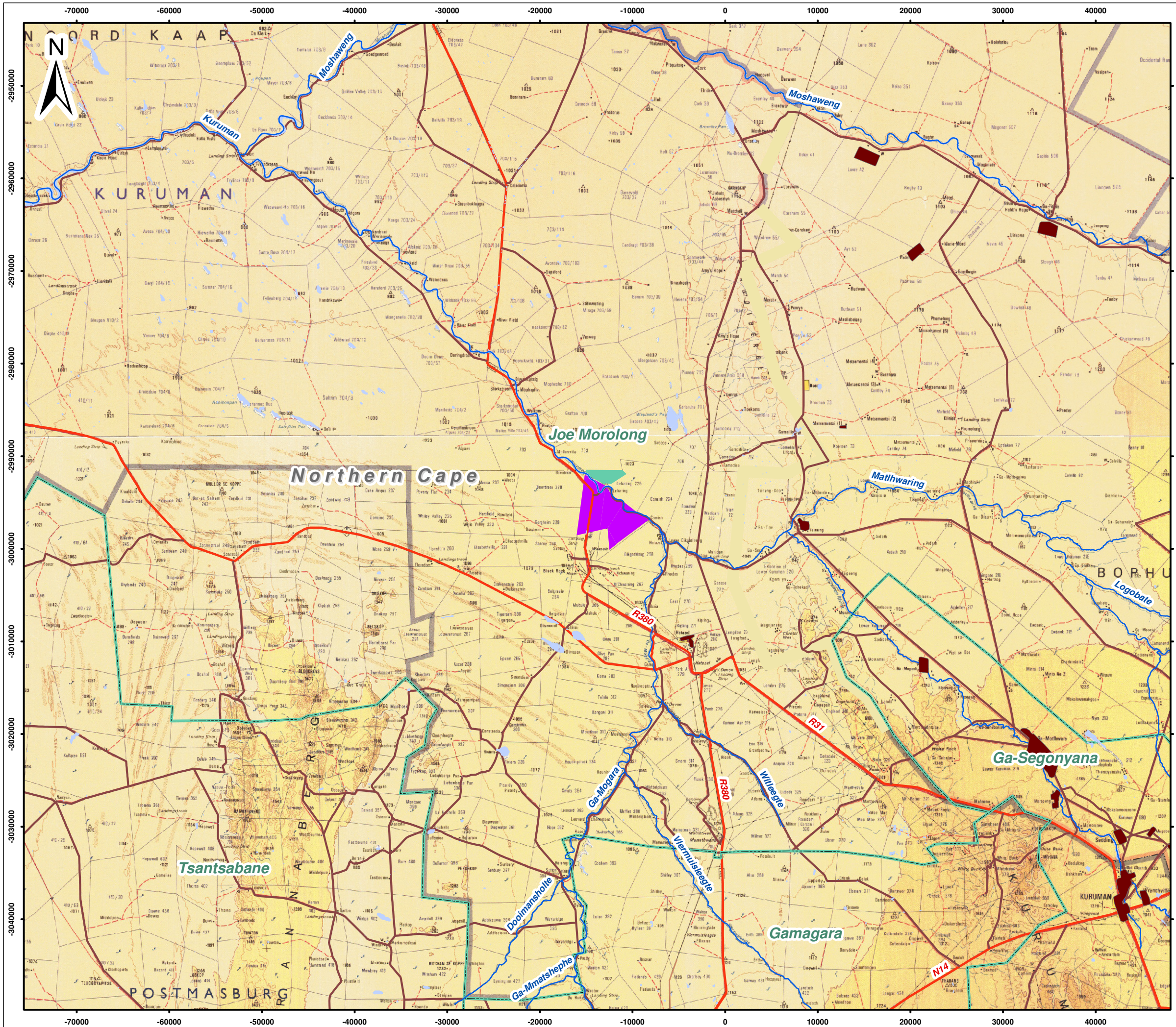
This financial provision has been prepared in accordance with GNR 1147 of the National Environmental Management Act (107/1998): *Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations*, published 20 November 2015 (Financial Provisioning Regulations, 2015).

Khwara held a prospecting right for manganese on Portion 2 of the farm Wessels 227 and the Remaining Extent and Portions 3 and 4 of the farm Dibiaghomo 226, north of Black Rock in the Northern Cape Province located approximately 1.6 km north east of the town Black Rock. The local and regional setting is illustrated in Figure 1 and Figure 2.

On the adjacent farm (Portion 1 of Lehating 741), Lehating holds the mining right and have an approved EMP from the DMR for manganese and iron (approved October 2013). Lehating also hold an EA, issued by the DENC in September 2014 in terms of the NEMA. It is important to note that the construction of the Lehating Mine commenced on 6<sup>th</sup> September 2017.

Khwara has applied to the DMR for a mining right over Portion 2 of the farm Wessels 227 and the Remaining Extent and Portions 3 and 4 of the farm Dibiaghomo 226. The resource will be accessed and mined from the Lehating mine (underground). Approved surface infrastructure at the Lehating Mine will be used to support the mining of the underground resource on the farms Wessels 227 and Dibiaghomo 226 and as such no surface infrastructure will be established as part of the proposed project.





**Legend**

- Approved Lehating Mining Right Area
- Proposed Mining Right Area
- Urban Areas
- Local Municipalities 2011
- Main Roads
- Secondary Roads
- Power Line
- Rivers and Streams
- 20m Contour Lines
- Wetlands

0 4 8 12 Kilometers

Scale: 1 : 400 000 @ A3

Projection: Transverse Mercator  
Datum: Hartbeeshoek, Lo23

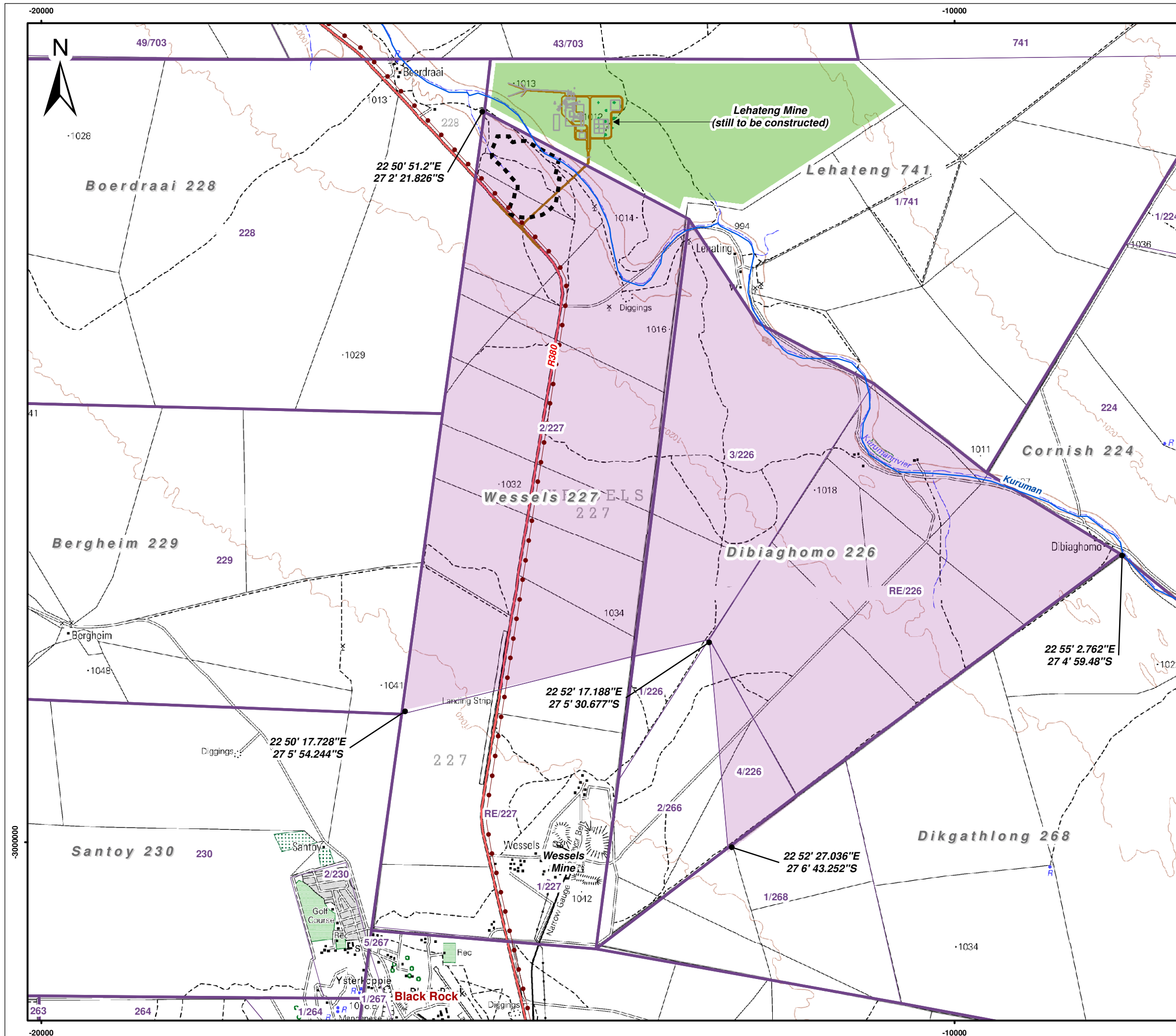
Khwara Manganese (Pty) Ltd

**Figure 1**  
**Regional Setting**



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Tel: +27 (11) 467-0945 Fax: +27 (11) 467-0978





- Legend**
- Approved Lehateng Mining Right Area
  - Proposed Mining Right Area
  - Khwara UG Mine Area
  - Main Roads
  - Secondary Roads
  - Power Line
  - Rivers and Streams
  - 20m Contour Lines
  - Farm Boundaries
  - Farm Portions



Scale: 1 : 41 000 @ A3

Projection: Transverse Mercator  
Datum: Hartbeeshoek, Lo23

Khwara Manganese (Pty) Ltd

**Figure 2**  
**Local Setting**



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720.12015.00004

2017/09/14

### 3.2 ENVIRONMENTAL AND SOCIO-ECONOMIC OVERVIEW

The information in this section provides a summary of the environmental and socio-economic baseline situation (Table 3) that is likely to be influenced by the proposed project. Information in this section was sourced from the environmental impact assessment (EIA) and EMP report (EMPr) compiled for the proposed project (SLR, September 2017). For further information, refer to Section 7.4 of the EIA and EMPr (SLR, September 2017).

**TABLE 3: OVERVIEW OF ENVIRONMENTAL AND SOCIO-ECONOMIC BASELINE SITUATION**

Aspect	Overview
Geology	The proposed project site is located in the Kalahari Basin which is a Manganese Hotazel Iron formation. The Kalahari Formation is approximately 80m thick and overlies the Dwyka Formation. The Dwyka Formation is approximately 200m thick and overlies the Hotazel Formation. The manganese ore body is located within the Hotazel Formation.
Biodiversity	<p>The tree species occurring in the proposed project area that are protected in terms of the National Forests Act of 1998 (Act 84 of 1998) are <i>Vachellia erioloba</i> (Camel Thorn), and <i>Vachellia haematoxylon</i> (Grey Camel Thorn). Farming practises, prospecting and mining activities within and surrounding the proposed project area, have disturbed the local faunal population.</p> <p>Aquifer Dependent Ecosystems (ADEs) occur throughout the South African landscape in areas where aquifer flows and discharge influence ecological patterns and processes. They are ecosystems, which require groundwater from aquifers for all or part of their life-cycle. ADEs provide habitats for an array of species, especially in arid areas, and are considered important in ecological processes and making available resources for the biodiversity in an area that would otherwise not be available. The protected Camel Thorn (<i>Vachellia erioloba</i>) trees are thought to act as keystone species in arid and semi-arid environments such as the Northern Cape Province of South Africa, and as such also the study area. As the rainfall in these areas is normally low and highly seasonal, these trees often have to rely on an alternative water source other than rainfall for large portions of the year. These trees are also exceptionally deep rooted, allowing them to access groundwater to depths up to 70 m below the surface.</p>
Groundwater	The proposed project area is underlain by two aquifers, namely the shallow aquifer and the deep fractured aquifer. Specialist input has indicated that there is no hydraulic connection between the shallow and the deep aquifers. Groundwater flow is in a north-west direction. Groundwater levels within and surrounding the proposed project area range from 20 to 70 m below ground level. Groundwater quality results show elevated concentrations of electrical conductivity, total dissolved solids, chloride, fluoride, nitrate, manganese and selenium when compared to the South African National Drinking Standards 241 of 2015. Groundwater within the proposed project area is utilised for livestock watering and domestic purposes.
Palaeontological resources	The project area is located on ancient rocks of the Ventersdorp and Olifantshoek Supergroups, as well as the Cenozoic Kalahari Group. It is considered unlikely that any fossils occur in the project area because the rock is too old and volcanic in origin. This is supported by the South African Heritage Agency palaeosensitivity map which shows that there is very little chance of finding fossils in this area.
Socio-economic	The town of Black Rock is located approximately 2.5km south of the proposed project area. The educational levels in the area are relatively low with a high level of unemployment and a dependency on subsistence agriculture, the public sector,

Aspect	Overview
	seasonal workers and employment in the mining sector. Water provision and sanitation remains a challenge, mostly in the rural areas. There has been an increase in the number of households that were provided with electricity as a source of energy in the area. Mining and government services are the main economic sectors.
Land use	Land uses surrounding the proposed project area include a combination of mining activities, a solar plant, livestock and game grazing, towns, isolated farmsteads and infrastructure (powerlines, Telkom lines, road networks). Land uses within the proposed project area include livestock grazing (taking place on portion 2 of the farm Wessels 227) and prospecting.

### 3.3 STAKEHOLDER ISSUES AND COMMENTS

As part of the EIA and EMPr process a public participation process was undertaken for the proposed project. Indirect issues and concerns raised by stakeholders that were taken into consideration during the development of the closure objectives are provided in Table 4 below.

TABLE 4: STAKEHOLDER ISSUES AND COMMENTS

Interested and affected parties	Date comments received	Issues raised	Response
<b>Landowners or lawful occupiers on adjacent properties</b>			
JJ van der Walt – resident on Dibiaghomo 226 RE	Comments received on 25 May 2017 via email.	<p>Rondom die waterstudie: Indien die myn se aktiwiteite tot gevolg het dat daar 'n verlies van ondergrondse water op die gedeelte (restant) wat in privaat besit is die myn verantwoordelik gehou sal /kan word.</p> <p>Translation: With reference to the water study: if the mine's activities results in a loss of underground water on the remaining extent, which is private property, the mine will be held responsible.</p>	<p>An independent groundwater study was conducted to assess the impact that the proposed project may have on groundwater. The results of this study are described in the EIA and EMP report.</p> <p>In summary, the study found that third party boreholes may experience a drop in groundwater levels. Key management measures include monitoring groundwater levels in third party boreholes identified within the simulated cone of depression and where Khwara's dewatering causes a loss of water supply to third parties, Khwara will provide compensation, which could include an alternative water supply of equivalent water quality and quantity, until such time as the dewatering impacts cease.</p>
<b>Department of Agriculture, Forestry and Fisheries</b>			
Jacoline Mans	Comments received on 19 January 2017 via email.	Consideration should be given to the potential impacts on protected trees (if any). Dust and dewatering may affect the long-term survival and health of deep – rooted tree species such as the Camel thorn ( <i>Vachellia erioloba</i> ) or Shephard's trees ( <i>Boscia albitrunca</i> ).	<p>An independent biodiversity specialist conducted a study to determine the impact that the proposed project will have on biodiversity. The findings of this biodiversity are described in the EIA and EMP report.</p> <p>In summary, the study found that no significant impacts are expected on biodiversity. However, current information on ADEs and deep rooted trees is limited and highly theoretical. Therefore a monitoring programme focussed on <i>V. erioloba</i> populations will be implemented to ensure that mining activities do not negatively affect these ADEs.</p>

Interested and affected parties	Date comments received	Issues raised	Response
Jacoline Mans	Comments raised at commenting authorities meeting held on 27 January 2017	<p>We are concerned that the presentation indicates that there will not be an impact on terrestrial plant and animal life. We acknowledge that emphasis is made to the impact on deep rooted trees as a result of dewatering; however, a loss in the condition of these trees such as the Camel Thorn will impact on other plant species and animals that are dependent on these trees for survival.</p> <p>It is suggested that a monitoring system is put in place to monitor the condition of the deep-rooted trees when mining commences. The particular area of concern will be the cone of depression zone, however if it is possible to extend the monitoring area further than the cone of depression zone this would be ideal. Please can these monitoring reports be made available to the Department of Agriculture, Forestry and Fisheries and the Department of Environment and Nature Conservation on an annual basis?</p> <p>If dewatering activities will impact on the deep-rooted plants, Tshipi (currently known as Khwara) could consider watering the plants.</p>	<p>An independent biodiversity specialist conducted a study to determine the impact that the proposed project will have on biodiversity. The findings of this biodiversity as described in the EIA and EMP report.</p> <p>In summary, the study found that no significant impacts are expected on biodiversity. However, current information on ADEs and deep rooted trees is limited and highly theoretical. Therefore a monitoring programme focussed on <i>V. erioloba</i> populations will be implemented to ensure that mining activities do not negatively affect these ADEs.</p>
Jacoline Mans	Comments received on 22 May 2017 via email.	<p>The Khwara Mine will be mined from the neighbouring Lehating Mine (still to be constructed) and as such no surface infrastructure will be established as part of this project, which is good from a vegetation clearance perspective, but dewatering and mining under the Kuruman River may potentially affect long-term survival of mature, deep-rooted protected trees such as Camel thorn <i>Vachellia erioloba</i>. The Department has recommended that a monitoring program be implemented (it was mentioned in the Scoping Report) to monitor tree health in the development footprint of the mine. It is recommended that a tree health survey be conducted bi-annually, the first one prior to mining (to be</p>	<p>An independent biodiversity specialist conducted a study to determine the impact that the proposed project will have on biodiversity. The findings of this biodiversity as described in the EIA and EMP report.</p> <p>In summary, the study found that no significant impacts are expected on biodiversity. However, current information on ADEs and deep rooted trees is limited and highly theoretical. Therefore a monitoring programme focussed on <i>V. erioloba</i> populations will be implemented to ensure that mining activities do not negatively affect these ADEs.</p>



Interested and affected parties	Date comments received	Issues raised	Response
		used as baseline data), followed by bi-annual assessments for the lifespan of the mine. The Scoping Report stated that the need for such monitoring will be determined by a specialist and a copy of the biodiversity assessment will be provided in the EIA report, therefore the DAFF will await the EIA report to make additional comments (if necessary). Kindly ensure that this office get a copy of the specialist biodiversity report.	

## 4 MINING PLAN AND SCHEDULE

Information in this section was sourced from the EIA and EMPr (SLR, September 2017) for the proposed project. A summary of the key project components is provided in the section below. For further detail refer to Section 4 of the EIA and EMPr (SLR, September 2017) for the proposed project.

The proposed project will not require the establishment of any surface infrastructure and as such the Khwara Mine is not associated with surface disturbance. Approved surface infrastructure at the Lehating Mine will be used to support the mining of the underground resource for the Khwara Mine. It follows that a construction phase is not applicable to the proposed project, and as such the section below only focuses on activities associated with the operational, decommissioning and closure phases of the Khwara Mine Project.

### 4.1 OPERATIONAL PHASE

#### 4.1.1 UNDERGROUND MINING METHOD

The resource to be mined is the manganese ore body of the Kalahari Manganese field. It is planned to mine the ore body using underground mining methods. It is anticipated that 0.55 million tonnes per annum of ore will be mined as part of the proposed project. The ore body is located at a depth of 220 m to 350 m meters below surface with a thickness of approximately 5 m to 9 m. Blasting and drilling methods will be used to loosen the ore material. The blasted Run of Mine (ROM) ore will be subjected to crushing and screening underground prior to being transport to surface via the Lehating Shaft.

#### 4.1.2 SUPPORT SERVICES UTILISED FROM THE LEHATING MINE

Support services for the proposed project will be sourced from the Lehating Mine. Further detail is provided in Table 5 below. It is important to note that the support services at the Lehating Mine are sufficient to support the proposed project for the short to medium term.

**TABLE 5: SUPPORT SERVICES**

Support service		Description
Transport	Road	The 10m wide, gravel access road that will be constructed from the R380 to the Lehating Mine will be utilised for the proposed project (Figure 2). The access road will be utilised for the transportation of employees, material, supplies, consumable and ore.
	Pipeline	A series of pipelines associated with the Lehating Mine will be utilised to transport potable water, firefighting water and process water to and from the underground workings.
Water supply and management	Potable water	Potable water for underground workings will be sourced from the Lehating water supply system.
	Process	Raw water will be used from process water and sourced from Lehating

Support service	Description	
	water	water supply system.
	Fire water	A firefighting water network will be installed underground, which will feed water to hydrants and hose reels. Underground firefighting water will be sourced directly from the Lehating Mine.
	Dewatering	Dewatering is required to make the underground workings safe. All water generated underground will be stored underground and will be used for dust allaying purposes underground. Only once the water inflow exceeds the water demand for dust allaying purposes will water be pumped from underground to surface at Lehating Mine.
Mineralised waste management	Waste rock	Minimum waste rock is expected to be generated by the proposed project as mining will be carried out on reef via Lehating's underground mine. In the event that waste rock, which will be low grade iron and manganese ore, is generated, waste rock will be transported underground to the Lehating Mine, and stored underground.
	Tailings dam	Ore generated by the proposed project will be sent to surface for processing at the Lehating Mine. All slurry material will be pumped for storage at the tailings dam at the Lehating Mine.
Non-mineralised waste management	Hazardous and general waste	Hazardous and general wastes generated by the proposed project will be temporarily handled and stored at the Lehating Mine in the waste management facility before being removed for recycling by suppliers, reuse by scrap dealers or final disposal at appropriately licensed waste disposal facilities.
	Sewage	All sewage generated from the proposed project will be treated at the Lehating Mine sewage treatment plant. Treated product will likely be used to enhance the potential of topsoil used at Lehating if authorised. If not the other alternative is to transport the sludge off site to a sewage plant in one of the towns in the region.
Employment and housing	Employees from the Lehating Mine will be utilised. The Khwara project will allow for the continuation of employment. No new employment opportunities envisaged. No housing will be provided during the operational phase. Operational workers will be accommodated in nearby towns, such as Black Rock, Hotazel, Kathu and Kuruman.	

#### 4.1.3 LIFE OF MINE

The mining portion of the Lehating Mining Project is planned to commence in 2018. The Khwara ore body will be accessible through Lehating's underground development in 2036. Therefore, subject to DMR approval, Khwara underground mining will commence in 2036 for a period of approximately 10 years.

#### 4.2 DECOMMISSIONING AND CLOSURE

Decommissioning and closure activities associated with any surface infrastructure used at the Lehating Mine will form part of the overall Lehating Mine decommissioning and closure related activities. Decommissioning related activities specific to the proposed project will include providing underground support. Closure related activities will focus on monitoring.

## 5 ENVIRONMENTAL RISK ASSESSMENT

### 5.1 RISK ASSESSMENT METHODOLOGY

The methodology applied to assess the significance of risks is provided in the table below.

**TABLE 6: CRITERIA FOR ASSESSING RISKS**

*Note: Part A provides the definition for determining impact consequence (combining severity, spatial scale and duration) and impact significance (the overall rating of the impact). Impact consequence and significance are determined from Part B and C. The interpretation of the impact significance is given in Part D.*

<b>PART A: DEFINITION AND CRITERIA*</b>	
<b>Definition of SIGNIFICANCE</b>	<b>Significance = consequence x probability</b>
<b>Definition of CONSEQUENCE</b>	<b>Consequence is a function of severity, spatial extent and duration</b>
<b>Criteria for ranking of the SEVERITY of environmental risks</b>	<b>H</b> Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	<b>M</b> Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	<b>L</b> Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	<b>L+</b> Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	<b>M+</b> Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	<b>H+</b> Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
<b>Criteria for ranking the DURATION of risks</b>	<b>L</b> Quickly reversible. Less than the project life. Short term
	<b>M</b> Reversible over time. Life of the project. Medium term
	<b>H</b> Permanent. Beyond closure. Long term.
<b>Criteria for ranking the SPATIAL SCALE of risks</b>	<b>L</b> Localised - Within the site boundary.
	<b>M</b> Fairly widespread – Beyond the site boundary. Local
	<b>H</b> Widespread – Far beyond site boundary. Regional/ national

#### **PART B: DETERMINING CONSEQUENCE**

<b>SEVERITY = L</b>					
<b>DURATION</b>	Long term	<b>H</b>	Medium	Medium	Medium
	Medium term	<b>M</b>	Low	Low	Medium
	Short term	<b>L</b>	Low	Low	Medium
<b>SEVERITY = M</b>					
<b>DURATION</b>	Long term	<b>H</b>	Medium	High	High
	Medium term	<b>M</b>	Medium	Medium	High
	Short term	<b>L</b>	Low	Medium	Medium
<b>SEVERITY = H</b>					
<b>DURATION</b>	Long term	<b>H</b>	High	High	High
	Medium term	<b>M</b>	Medium	Medium	High
	Short term	<b>L</b>	Medium	Medium	High
			<b>L</b>	<b>M</b>	<b>H</b>
			Localised Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional/ national
			<b>SPATIAL SCALE</b>		

#### **PART C: DETERMINING SIGNIFICANCE**

<b>PROBABILITY (of exposure to impacts)</b>	Definite/ Continuous	<b>H</b>	Medium	Medium	High
	Possible/ frequent	<b>M</b>	Medium	Medium	High
	Unlikely/ seldom	<b>L</b>	Low	Low	Medium
			<b>L</b>	<b>M</b>	<b>H</b>

<b>CONSEQUENCE</b>
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<b>PART D: INTERPRETATION OF SIGNIFICANCE</b>	
<b>Significance</b>	<b>Decision guideline</b>
High	It would influence the decision regardless of any possible mitigation.
Medium	It should have an influence on the decision unless it is mitigated.
Low	It will not have an influence on the decision.

**\*H = high, M= medium and L= low and + denotes a positive impact.**

## **5.2 IDENTIFICATION OF STRATEGIES TO MANAGE AND MITIGATE THE IMPACTS AND RISKS**

Impacts and risks identified for the proposed project that are likely to extend post-closure are included in Table 8 below. Strategies to manage and mitigate impacts and risks have been identified, taking into account, the findings of specialist studies (where relevant), input from stakeholders and consideration of the project plan. These management and mitigation strategies are aimed at controlling the project activities and process which have the potential to result in environmental degradation.

**TABLE 7: IMPACTS AND RISKS IDENTIFIED FOR THE PROPOSED PROJECT**

Aspect	Potential impact	Impact discussion	Impact rating	
			Unmitigated	Mitigated
Biodiversity	Indirect loss and/or disturbance of terrestrial ecology through a lowering of groundwater levels	<p>The proposed project has the potential to indirectly disturb vegetation, vertebrates and invertebrates during the operation, decommissioning and closure phases. This is because some ecosystems require groundwater from aquifers for all or part of their life-cycle. These Aquifer Dependent Ecosystems (ADEs) occur throughout the South African landscape in areas where aquifer flows and discharge influence ecological patterns and processes. ADEs provide habitats for an array of species, especially in arid areas, and are considered important in ecological processes and making available resources for the biodiversity in an area that would otherwise not be available. Dewatering activities during the operational phase could therefore impact on ADEs by reducing the availability of shallow groundwater.</p> <p>In this project there are various factors that make this an insignificant issue:</p> <ul style="list-style-type: none"> <li>• The surface geology of the area falls within the Kalahari formation which is approximately 80 m deep. The Kalahari Aquifer therefore forms part of this upper geological layer. It is highly likely that trees in the area could rely on the Kalahari Aquifer, as roots of these species have been recorded deeper than 60 m.</li> <li>• The manganese ore lies within the Hotazel formation, which is overlain by the Dwyka formation (200 m deep), containing the deeper lying Dwyka Aquifer. This deeper aquifer will be subjected to dewatering during the mining process. Dewatering of the Dwyka Aquifer for mining purposes is not expected to significantly impact on the shallow Kalahari Aquifer. As such, it is highly unlikely that the ADEs associated with the study area will be impacted during the mining operation.</li> </ul>	Insignificant	
	Alteration of sub-surface flow affecting aquatic ecosystems	<p>The proposed project includes mining beneath the Kuruman River. In the event that underlying aquifers contribute towards sub-surface flow, a lowering of groundwater levels from dewatering may alter the existing sub-surface flow of the Kuruman River, and its associated wetland system.</p> <p>However the groundwater study has concluded that the river is not expected to be in hydraulic continuity with the main water table. This impact is therefore insignificant.</p>	Insignificant	
Groundwater	Reduction of groundwater levels and availability to third	It is necessary to dewater the underground mining area to create a safe working environment. With dewatering the concern is that third party groundwater users may be negatively affected. This activity will take place during operations and will cease in the decommissioning phase. Upon closure, the groundwater levels will be allowed to rebound	High	Low

Aspect	Potential impact	Impact discussion	Impact rating	
			Unmitigated	Mitigated
	parties due to dewatering	naturally.  The simulated cone of drawdown reaches its maximum extent in the operational phase and third party boreholes fall within the simulated cone of drawdown. A slight shift in the cone of drawdown was simulated to occur after and an additional third party borehole could experience a slight drop in water levels. The simulation showed that groundwater levels would not recover within the 100 year simulation period and shows a sustained depressed high in the unmitigated scenario and low with mitigation.		
Socio-economic	Positive socio-economic impact	In the broadest sense, all activities associated with the proposed project contribute towards a positive economic impact in all phases. Mining has a positive net economic impact on the national, local and regional economy. Direct benefits are derived from wages, taxes and profits. Indirect benefits are derived through the procurement of goods and services, and the increased spending power of employees.  The Khwara Project will essentially continue the economic contribution from Lehating operations for an additional 10 years. An additional 10 years will result in a R7.2 billion operational revenue. The continued economic contribution as a result of the proposed development will have a sustained and directly positive impact on direct, indirect and induced effects on the local, regional and national economy as it. The proposed Khwara Project will sustain the 350 Lehating mining job opportunities and associated secondary employment opportunities within the local and regional area for a further 10 years. This has the potential to generate an employment value of between R 332.2 and R 772.7 million over the 10 years of LOM.  In addition to the direct and indirect economic impacts discussed above, the mine, through its corporate social investments and Social and Labour Plan, will contribute towards the local economic development in the area. The operation of the proposed mine has following positive socio-economic benefits to its employees and surrounding communities in conjunction with Lehating Mine: <ul style="list-style-type: none"> <li>• Managing the development of skills through its skills development plan</li> <li>• Managing learnership programs to provide learners with an occupational qualification</li> <li>• Managing investment in infrastructure development through local economic development and integrated development programmes.</li> </ul>	Low positive	High positive
	Inward migration	Mining projects often cause an influx of people in search of employment. This inward	High	Moderate

Aspect	Potential impact	Impact discussion	Impact rating	
			Unmitigated	Mitigated
		migration causes a range of secondary impacts such as increased pressure on infrastructure and services such as hospitals and water supply, housing etc., as well as the potential development of informal settlements. Other secondary impacts include social ills such as an increase in crime and the spread of diseases such as HIV/Aids.		



**TABLE 8: STRATEGIES TO MANAGE AND MITIGATE IMPACTS AND RISKS**

Aspect	Potential impact	Strategies to manage and mitigate impacts and risks
Biodiversity	Indirect loss and/or disturbance of terrestrial ecology through a lowering of groundwater levels	<ul style="list-style-type: none"> <li>• Current information on ADEs and deep rooted trees is however limited and highly theoretical. Therefore a monitoring programme focussed on <i>V. erioloba</i> populations will be implemented to ensure that mining activities do not negatively affect these ADEs. Monitoring areas have been identified during the field investigation, and divided into priority classes according to the zones of simulated drop in groundwater levels, by identifying areas where large <i>V. erioloba</i> populations were present.</li> <li>• Should it be determined at any time during the monitoring process that the trees are undergoing stress as a result of the mining operation, an irrigation protocol should be established whereby the trees receive water down at root level. This may be achieved through the insertion of irrigation pipes which reach root level.</li> <li>• All <i>Prosopis glandulosa</i> trees associated with the Kuruman River falling within the anticipated cone of drawdown be removed. This will have a positive impact on any ADEs within the zone of influence as more water will be available in the landscape for any possible ADEs.</li> </ul>
	Alteration of sub-surface flow affecting aquatic ecosystems	Not applicable
Groundwater	Reduction of groundwater levels and availability to third parties due to dewatering	<ul style="list-style-type: none"> <li>• Update the hydrocensus to check for any new third party water uses prior to mining</li> <li>• Monitor groundwater levels in third party boreholes identified within the cone of depression once Khwara's dewatering activities commence.</li> <li>• Where Khwara's dewatering causes a loss of water supply to third parties, Khwara must provide compensation, which could include an alternative water supply of equivalent water quality and quantity, until such time as the dewatering impacts cease.</li> <li>• With respect to the potential drop in water levels in Boer 1 and Wessels 2 boreholes, the mine will report water level measurements to the land users on request in order to closely monitor and allow for ongoing meaningful discussions with respect to managing water supply impacts</li> </ul>
Socio-economic	Positive socio-economic impact	<ul style="list-style-type: none"> <li>• Khwara will play an active role in recruitment for the Lehating Mine, as practically possible, to ensure that as far as possible people from the local communities are employed.</li> <li>• Khwara will play an active role in training and skills development of the Lehating Mine workforce, as practically possible, which will focus on basic literacy, basic numeracy and basic business skills, which will enhance future employment opportunities outside the mine.</li> <li>• Khwara, in conjunction with Lehating, will support the development and growth of small and medium enterprises in local communities and on-going skills development programmes that will be made</li> </ul>

Aspect	Potential impact	Strategies to manage and mitigate impacts and risks
		<p>available to the labour force. This will be achieved in conjunction with other mines in the area.</p> <ul style="list-style-type: none"> <li>• Khwara, through its shareholders, will implement a formal bursary and skills development programme in conjunction with Lehating to focus on the closest communities to increase the number of local skilled people and thereby increase the potential local employee base.</li> <li>• Khwara, in conjunction with Lehating, will ensure that it incorporates economic considerations into its closure planning from the outset. This will require close consultation and co-operation with Lehating in developing this plan. Closure planning considerations will cover the skilling of employees for the downscaling, early closure and long term closure scenarios. The plan must identify and develop sustainable business opportunities and skills, independent from mining for members of the local communities to ensure continued economic prosperity beyond the life of mine.</li> </ul>
	Inward migration	<ul style="list-style-type: none"> <li>• Lehating and Khwara must jointly continue to manage expectations by communicating the exact number of new job opportunities (permanent and temporary) and procurement opportunities to the public together with the required skills and qualifications.</li> <li>• Khwara will play an active role in recruitment of Lehating Mine workforce, as practically possible, which is aimed at: <ul style="list-style-type: none"> <li>○ Maintaining good communication with all job and procurement opportunity seekers throughout the recruitment process. The process must be seen and understood to be fair and impartial by all involved. The personnel in charge of resolving recruitment and procurement concerns must be clearly identified and accessible to potential applicants</li> <li>○ Recruitment and procurement, by the mine and its contractors, will be preferentially provided to people in the communities, where possible, that are closest to the mine. In order to be in a position to achieve this, a skills register of people within the closest communities will be maintained. Khwara will also preferentially provide bursaries and training to people that reside in these closest communities</li> <li>○ There will be no recruitment or procurement at the gates of the mine. All recruitment will take place off site, at designated offices in the closest communities or at a centralised office set up by the mine. All procurement will be through established procurement and tendering processes and preference will be given to service providers from the closest communities.</li> </ul> </li> <li>• Khwara, in conjunction with Lehating, will work with local mines, local authorities and law enforcement officials to monitor and prevent the development of informal settlements near the mine.</li> <li>• Khwara, in conjunction with Lehating, will implement a policy on HIV/AIDS and tuberculosis. This policy will be developed for the workforce to address the concerns regarding the pandemic. A training programme on HIV/AIDS will be implemented on the mine to ensure employees are educated and made aware of the risks involved.</li> </ul>

Aspect	Potential impact	Strategies to manage and mitigate impacts and risks
		<ul style="list-style-type: none"><li data-bbox="696 284 1957 370">• Khwara, in conjunction with Lehating, will implement a stakeholder communication, information sharing and grievance mechanism to enable all stakeholders to engage with the mine on both socio-economic and environmental issues.</li></ul>

### 5.3 IDENTIFICATION OF INDICATORS

Aquifer Dependant Ecosystems (ADE's) provide habitats for an array of species, especially in arid areas, and are considered important in ecological processes and making available resources for the biodiversity in an area that would otherwise not be available. Species associated with deep root systems such as the Camel Thorn (*Vachellia erioloba*) located within the proposed project area; use their deep roots to access deep water. A mine related drop in groundwater levels can effectively place these trees under stress in a situation where they are unable to reach water, particularly with larger trees as they are less adaptable to a change in groundwater levels than smaller trees. The indirect loss and/or disturbance of terrestrial ecology may influence ad-hoc grazing activities within and surrounding the proposed project area.

Based on specialist investigations (STS, August 2017 and SLR, September 2017A), it is understood that dewatering activities are limited to the deep aquifer. Deep rooted tree species access water from the shallow aquifer. Given that there is no hydraulic connectivity between the shallow and the deep aquifer it is unlikely that the proposed project will influence the current vegetation condition of the *Vachellia erioloba* within and surrounding the proposed project area. This is supported by the insignificant impact rating as outlined in Table 7.

With reference to Section 5.5, the proposed project is not anticipated to be associated with any latent impacts associated with groundwater abstraction. This is supported by the low impact rating as outlined in Table 7.

While the discussion above highlights that post closure impacts are unlikely, it is important to note that vegetation condition and groundwater levels have been identified as the two key indicators which will facilitate the evaluation of the on-going environmental impacts and associated risk to closure. Even though no latent impacts are expected as a result of the proposed project, it is important to monitor groundwater levels to verify this. As part of on-going monitoring associated with the operation of the mine, monitoring of biodiversity zones will be undertaken to ensure that no stress on protected trees (*Vachellia erioloba*) is experienced. In the event that stress on protected trees is encountered during the operational phase, it is important that post closure monitoring of the vegetation condition is undertaken. Taking this into consideration post-closure monitoring has been provided for as a precautionary approach based on these two key indicators. Refer to Section 15 for further detail.

### 5.4 REASSESSMENT OF RISKS

Not applicable.

## 5.5 FINANCIAL PROVISION FOR LATENT ENVIRONMENTAL IMPACTS

No latent closure impacts have been identified. Groundwater recharge/rebound is not expected to result in any seepage/decant at surface requiring attention. Furthermore, groundwater quality is not expected to change as a result of the mining activities.

# 6 CLOSURE DESIGN PRINCIPLES

## 6.1 LEGAL AND GOVERNANCE FRAMEWORK

This report has been drafted in accordance with the Financial Provisioning Regulations, 2015 (GNR 1147 of 20 November 2015), for inclusion into the EIA and EMPr for the proposed Khwara project.

It is a requirement of the Environmental Impact Assessment Regulations, 2014 (GNR 982 of 4 December 2014) (as amended) that a closure plan must contain the information set out in Appendix 4 of these Regulations (GNR 982), and, where the application for an environmental authorisation is for prospecting, exploration, extraction and primary processing of a mineral or petroleum resource or activities directly related thereto, the closure plan must address the requirements as set in the Financial Provisioning Regulations, 2015 (GNR 1147).

It is a requirement of the Mineral and Petroleum Resources Development Amendment Bill, 2013 (Bill 15 of 2013) that the holder of a mining right must make the prescribed financial provision for the rehabilitation and management of any negative environmental impacts due to mining activities.

## 6.2 VISION, OBJECTIVES AND TARGETS FOR CLOSURE

The vision, objectives and targets for closure have been developed against local environmental and socio-economic context of the proposed project, as well as, regulatory requirements and stakeholder issues and concerns.

Stakeholders will continuously be involved in the closure planning process throughout the mine life. The mine will strive to maintain a good working relationship with stakeholders and the local communities in which they operate. Agreements and final approval will be sought from authorities as closure approaches.

### 6.2.1 VISION FOR CLOSURE

The current land use associated with the proposed project is grazing. The vision for closure is to minimise the impacts associated with the closure and decommissioning of the mine and to ensure the continued use of the current land use.

### **6.2.2 OBJECTIVES FOR CLOSURE**

The preliminary closure plan objectives include the following:

- Allow for the continued use of the current land use (grazing)
- Minimise the loss of third party groundwater supply
- Mine closure is achieved efficiently, cost effectively and in compliance with the law

### **6.2.3 TARGETS FOR CLOSURE**

The closure target outcomes for the proposed project are as follows:

- Protect surrounding groundwater resources from loss of current utility value
- Maintain fauna and flora ecosystem functioning.

### **6.3 ALTERNATIVE CLOSURE OPTIONS**

No alternative closure and post closure options have been considered at this stage. Any alternative and practical closure and post closure options will be investigated during the on-going operations of the proposed mine.

### **6.4 MOTIVATION FOR PREFERRED CLOSURE OPTION**

The current land capability of the proposed project area is grazing. Given that no surface infrastructure will be established as part of the proposed project the preferred closure option is that the current land use remains unchanged.

### **6.5 MOTIVATION FOR CLOSURE AND POST CLOSURE PERIOD**

The following post-closure period is proposed:

- Groundwater monitoring for 8 years
- Biodiversity inspections for 8 years.

Further detail pertaining to the post-closure monitoring is provided in Section 9.

### **6.6 ONGOING RESEARCH FOR PROPOSED CLOSURE OPTIONS**

Not applicable.

## 6.7 CLOSURE PLAN ASSUMPTIONS

The following assumptions are made for the development of the preliminary closure plan at this stage of the project:

- The mine will follow and adhere to the commitments made in the EIA and EMPr
- Groundwater in the upper shallow aquifer will not be negatively impacted by the underground workings
- The preliminary closure plan assumes that there will be no latent impacts associated with the proposed project and that the Kuruman River is unlikely to be influenced due to the lack of groundwater contribution towards base flow
- There has been no consideration of the social closure costs has been included in this report.
- All costs associated with pre-closure monitoring, auditing and reporting are presumed to be covered under the operations expenditure of the mine, and have not been included in this preliminary closure plan
- The determination of the financial provision assumed that no surface infrastructure will be established as part of the project.
- As a precautionary approach, the post closure monitoring assumes that the protected trees (*Vachellia erioloba*) will experience stress as a result of mining operations and that post closure monitoring will take place for a period of 8 years. Although not costed for, the post closure monitoring period will be extended if trees are still showing signs of stress after the 8-year post-closure monitoring period. Should no negative effect on these trees be observed during operations, the monitoring programme may be adjusted to cater for post closure monitoring for a period of five years on an annual basis in the dry season, to ensure there was no delay in the effect on these ADEs.
- It is currently assumed that most of the monitoring and maintenance activities will be undertaken in the first 5 years following closure (the active maintenance period), and thereafter the frequency of activities is expected to decline (the passive maintenance period). The passive maintenance period is a further 3 years of monitoring and maintenance with a reduced frequency.

Assumptions will be reviewed during the ongoing operations of the proposed mine and any required technical work conducted in order to reduce information gaps and uncertainty prior to mine closure.

## 7 POST-CLOSURE LAND USE

The current land use of grazing is expected to continue.

## 8 CLOSURE ACTIONS

Given that no surface area will be disturbed as part of the proposed project the only closure actions is the implementation of the post-closure monitoring programme.

## **9 SCHEDULE OF CLOSURE ACTIONS**

The schedule and cost associated with post-closure monitoring programme is provided in Table 9 below.



TABLE 9: SCHEDULE AND COST OF POST-CLOSURE MONITORING

Item	Monitoring / Maintenance Activity	Cost / Sample	Duration (years)	Frequency	Unit	Quantity	Total Cost
<b>1</b>	<b>WATER QUALITY AND WATER LEVELS</b>						
1.1	<b>Collection and laboratory analysis of groundwater samples and measuring water levels</b>						
1.1.1	Decommissioning and Rehabilitation Phase	R 1 750	0	quarterly	Sum	0	R 0
1.1.2	Maintenance and Aftercare (Active)	R 1 750	5	quarterly	Sum	300	R 525 000
1.1.3	Maintenance and Aftercare (Passive)	R 1 750	3	bi-annual	Sum	60	R 105 000
<b>2</b>	<b>BI-ANNUAL INSPECTIONS</b>						
2.1	<b>Biodiversity inspections</b>						
2.1.1	Decommissioning and Rehabilitation Phase	R 60 000	0	bi-annual	Sum	0	R 0
2.1.2	Maintenance and Aftercare (Active)	R 60 000	5	bi-annual	Sum	10	R 600 000
2.1.3	Maintenance and Aftercare (Passive)	R 30 000	3	bi-annual	Sum	6	R 180 000
2.1.4	No. of Days on Site Report Compilation Rate per day						R 15 000
<b>3</b>	<b>MANAGEMENT OF MONITORING AND MAINTENANCE</b>						
3.1	<b>On-site maintenance, monitoring and aftercare</b>	<b>Rate / day</b>	<b>Total/month</b>	<b>Total/year</b>	Years	0	R 0
	- 1 Manager	R 10 000	R 0	R 0			
	- 1 Field Supervisor	R 500	R 0	R 0			
	- 5 Labourers	R 250	R 0	R 0			
	<b>TOTAL</b>						<b>R 1 410 000</b>

## 10 ORGANISATIONAL CAPACITY

The key personnel who ensure compliance with the EMP commitments are the project's environmental superintendent.

## 11 GAP IDENTIFICATION

Current gaps (or known and unknowns) associated with the closure plan that has not been costed for at this stage but will be addressed once the mine is operational include:

- Sealing of any underground workings and/or ongoing dewatering of the mine. At this stage, it is understood that Khwara will extend the life of Lehating Mine, and Lehating Mine will not be operational following the closure of Khwara Mine
- The effect that underground mining may have on the surface topography and drainage i.e. local subsidence and/or providing underground support
- The impact that mine dewatering will have on terrestrial plant and animal life, especially deep rooted trees and plants i.e. if required, artificially preserving biodiversity until naturally self-sustainable
- No post closure maintenance and aftercare of Khwara mine site, since there will be no disturbed areas requiring aftercare. This also assumes that there will be no over-grazing on the property.

## 12 RELINQUISHMENT CRITERIA

The key relinquishment criteria are ensuring that there is no decant and that ADE's maintain ecosystem functionality.

## 13 CLOSURE COST ESTIMATION

### 13.1 CLOSURE COST ASSUMPTIONS

The closure plan and cost estimate assumptions are outlined in Section 6.7.

### 13.2 CLOSURE COST METHODOLOGY

#### 13.2.1 QUANTITIES

The quantities were based on experience within the industry.

### 13.2.2 UNIT RATES

The rates used for the determination of this closure liability have been derived from SLR's own database of rates. This database is considered to be a national average of rates for South African operations, since the rates are obtained from various sources throughout the country. These rates are typically acquired through SLR's experience in the industry.

Where up-to-date rates are not available, then previous known rates are escalated by a contract price adjustment formula (that is considered appropriate by SLR - specifically for closure related activities). The escalation rate is obtained from the monthly data provided by Statistics South Africa ([www.statssa.gov.za](http://www.statssa.gov.za)).

The rates provided in Table 10 are considered satisfactory by SLR to meet the 80% accuracy requirement for proposed mine with a LOM of 10 years (as per the Financial Provisioning Regulations, 2015 (GNR 1147)).

**TABLE 10: RATES USED FOR THE CLOSURE LIABILITY CALCULATIONS**

Description	Unit	Rate
Care and maintenance for 8 years	ha	R 0.00
Reclamation monitoring for 8 years	Sum	R 1 410 000.00
Specialist study (Screening level risk assessment)	Sum	R 200 000.00

### 13.2.3 TIME, FEE AND CONTINGENCY COSTS

The following time, fee and contingency costs have also been included in the closure cost calculations based on SLR's experience with similar projects.

**TABLE 11: TIME, FEE AND CONTINGENCY COSTS**

Description	Unit	Quantity
Preliminary and General	%	12
Contingencies	%	10

### 13.3 CLOSURE COST CALCULATION (LOM)

The closure cost calculation for the proposed project at LOM is provided in Table 12 below.

**TABLE 12: CLOSURE COST CALCULATION**

Description	Unit:	Quantity	Master rate	Amount (R)
Care and maintenance for 8 years	ha	2 987	R 0.00	R 0.00
Biodiversity inspections for 8 years	Sum	1.00	R 1 410 000.00	R 1 410 000.00

Description	Unit:	Quantity	Master rate	Amount (R)
Specialist study (Screening level risk assessment)	Sum	1.00	R 200 000.00	R 200 000.00
		<b>Subtotal 1</b>		R 1 610 000.00
Preliminary and General (P&G)		12.0% of Subtotal 1		R 193 200.00
-	-	<b>Subtotal 2</b>		R 1 803 200.00
-	-	(Subtotal 2 plus P&G value)		
Contingency		10.0% of Subtotal 2		R 180 320.00
-	-	<b>Subtotal 3</b>		R 1 983 520.00
-	-	(Subtotal 3 plus Contingency value)		
VAT		14.0% of Subtotal 3		R 277 692.80
<b>GRAND TOTAL FOR MINING OPERATIONS (Subtotal 3 plus VAT)</b>				<b>R 2 261 212.80</b>

## 14 ANNUAL REHABILITATION PLAN

According to the Financial Provisioning Regulations, 2015 (GNR 1147), an annual rehabilitation plan needs to be compiled. No surface infrastructure will be developed for the proposed project and therefore no surface rehabilitation will be required.

## 15 MONITORING, AUDITING AND REPORTING

### 15.1 PRE-CLOSURE MONITORING, AUDITING AND REPORTING

The environmental manager will conduct internal audits against the commitments in the EMPr. Pre-closure monitoring will be done in line with the proposed monitoring programme outlined in the EMPr (SLR, September 2017).

In accordance with Regulation 55 of Mining Regulation 527 (23/04/2004), and Regulation 982 of the National Environmental Management Act (107 of 1998) (NEMA) (4/12/2014), an independent professional will conduct an EMP performance assessment every 2 years. The site's compliance with the provisions of the EMPr and the adequacy of the EMPr is assessed in the performance assessment.

In accordance with the Financial Provisioning Regulations, 2015 (GNR 1147), financial provision for closure, as well as, unforeseen premature closure will be updated on an annual basis. This update will be carried out by external and independent environmental consultants.

All costs associated with pre-closure monitoring, auditing and reporting are assumed to be covered under the operational expenditure of the mining operations, and have not been included in this report.

## 15.2 POST-CLOSURE MONITORING, AUDITING AND REPORTING

Post-closure monitoring, auditing and reporting will comprise:

- Post-closure monitoring activities for an 8-year period as outlined in Table 13
- The continuation of external EMP performance assessments by an independent professional until such time as a closure application is applied for
- The continuation of annual financial provision updates by external and independent environmental consultants until such time as a closure application is applied for.

**TABLE 13: PROPOSED MONITORING PROGRAM**

<b>Rehabilitation targets</b>	<b>Method of monitoring</b>	<b>Frequency of monitoring</b>	<b>Monitoring period</b>	<b>Actions to be taken if target is not reached</b>
Vegetation conditions	Visually biodiversity inspections by a qualified person to ensure there are not effects on the <i>Vachellia erioloba</i>	Bi-annual monitoring	Monitoring will take place for a period of eight years. The post closure monitoring period will be extended if trees are still showing signs of stress after the 8-year post-closure monitoring period.	An irrigation protocol should be established. This protocol would include the watering of the protected tree species.
Stable groundwater levels	Taking groundwater level measurements	Quarterly monitoring. Provision has been made for the measurement of 15 boreholes within and around the proposed project site	Monitoring will take place for a period of 8 years	An alternative water supply will be provided to any third parties experiencing a loss in water supply.

## 16 CONCLUSION

Khwara has applied to the DMR for a mining right over the above portions of the farms Wessels 227 and Dibiaghomo 226, referred to as the Khwara Mine project. The resource will be accessed and mined from the Lehating mine (underground). Approved surface infrastructure at the Lehating Mine will be used to support the mining of the underground resource on the farms Wessels 227 and Dibiaghomo 226 and as such no surface infrastructure will be established as part of the proposed project.

This report provides a preliminary closure plan and financial provision for the development of the proposed new underground Khwara Manganese Mine. This report has been compiled in accordance with GNR 1147 of the National Environmental Management Act (107/1998): *Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations*, published 20 November 2015 (Financial Provisioning Regulations, 2015).

Based on preliminary closure costs outlined in this document, the updated financial provision is calculated at R 2 261 212.80 (Excluding VAT) at life of mine and meets the 80% accuracy requirement for the proposed mine with a life of mine of 10 years.

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## 17 REFERENCES

Scientific Terrestrial Services CC, Determining the Presence of *Vachellia erioloba* Trees and the effect groundwater abstraction for mining related activities will have on *Vachellia erioloba* aquifer (groundwater) dependent ecosystems, within the Northern Cape Province, August 2017.

SLR Consulting (South Africa) (Pty) Ltd, Environmental Impact Assessment and Environmental Management Programme Report for the development of the underground Khwara Manganese Mine, September 2017.

SLR Consulting (Africa) (Pty) Ltd, Khwara Groundwater Study, Numerical Model, August 2017A.



**APPENDIX A: CURRICULUM VITAE**



## RECORD OF REPORT DISTRIBUTION

<b>SLR Reference:</b>	720.12015.00004
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<b>Report Number:</b>	1
<b>Proponent:</b>	Khwara Manganese (Pty) Ltd

<b>Name</b>	<b>Entity</b>	<b>Copy No.</b>	<b>Date issued</b>	<b>Issuer</b>
Jeff Leader	Khwara Manganese (Pty) Ltd	Electronic	September 2017	N Smyth

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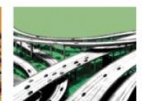
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